is heated during the time it is in the chamber. This allows simultaneous bonding at multiple positions on larger wafers in a relatively small chamber.

[0043] According to a particular embodiment, the metallization at various positions is formed using metals of varying melting points, see 620 showing the metal melting temperature versus distance from the chamber wall. The material towards the outer edge of the wafers 622 has a higher melting point, while the material towards the center of the wafers 624 has a lower melting point. The microwave energy may follow the curve 626 shown in figure 6. Therefore, more microwave energy is presented at the area 622 and less at the area 624.

[0044] Other modifications are contemplated. For example, a stack of multiple substrates could be bonded.

[0045]

Claims

[c1]

1.A method comprising:

placing a first substrate with a first surface part that has better microwave absorption than said first substrate, against a second substrate with a second surface part that has better microwave absorption than said second substrate;

aligning said first surface part with said second surface part; and

applying microwave energy to the first and second parts to bond the first substrate to the second substrate.

[c2]

2.A method as in claim 1, wherein the first substrate is placed on top of the second substrate, and is held only by gravity during bonding.

[c3]

3.A method as in claim 1, wherein said bonding includes hermetically sealing a cavity.

[c4]

4.A method as in claim 3, wherein said first and second parts each extend around a closed perimeter, and wherein said hermetically sealing comprises hermetically sealing

along an entirety of said closed perimeter.5.A method as in claim 2, wherein said first and second surface parts are metals.

[c5]

6.A method as in claim 5, wherein said substrate is poorly microwave absorbing silicon.

[c6]

7.A method as in claim 1, wherein said first substrate has an outer surface part formed of a material with a high imaginary dielectric constant ϵ''.

[c7]

8.A method, comprising:

forming a first substrate having a poorly microwave absorbing material at a first portion and a thin film of better absorbing material at a second portion;

forming a second substrate having a poorly microwave absorbing material, having a material at a first portion, and a thin film of better absorbing material at a second portion; and

using microwave energy to bond the thin films.

[c8]

9.A method as in claim 8, wherein said first substrate is held on the second substrate by gravity only. 10.A method as in claim 9, wherein the first substrate includes an indented portion therein, and said bonding comprises hermetically sealing around a perimeter of the indented portion.

[c9]

11. A method, comprising:

placing a first substrate of a first material, having a first area defined within a perimeter of a second material, against a second substrate, of the third material, said second substrate also having a second area defined within a perimeter of a fourth material, and wherein said first and third materials are poorer absorbers of microwaves than said second and fourth materials; and

applying microwaves to an area of said first substrate and said second substrate to bond said second material to said fourth material.

[c10]

12. A method as in claim 11, wherein said first and third materials are semiconductor materials.

[c11]

13. A method as in claim 12, wherein said second and fourth materials are metal materials.

[c12]

14. A method as in claim 11, wherein said second and fourth materials define a perimeter with a closed shape.

[c13]

15. A method as in claim 14, further comprising forming a hermetically sealed cavity within said perimeter.

[c14]

16. A method as in claim 11, wherein said placing comprises placing one of said substrates on the top of the other of said substrates.

[c15]

17. A method as in claim 16, wherein said one and said other substrates are held together only by gravity during said bonding.

[c16]

18. A method as in claim 16, wherein said one and said other substrates are held together by an additional weight.

[c17]

19. A method as in claim 13, wherein said second and fourth materials are gold.

[c18]

20. A method as in claim 18, wherein said additional weight is sapphire.

[c19]

21. A device, comprising:

a first substrate of a material that is a poor absorber of microwaves, having a first surface that is a better absorber of microwaves;

a second substrate of a material that is a poor absorber of microwaves, having a second surface that is a better absorber of microwaves that is aligned with the first surface;

said first and second surfaces, coupled together to define an area of connection therebetween.

[c20]

22. A device as in claim 21, wherein said material of said substrate is semiconductor material.

[c21]

23. A device as in claim 21, wherein said first and second surfaces are metals.

[c22]

24. A device as in claim 21, wherein said metal has a thickness within an order of magnitude of the skin depth of the first and second surfaces.

[c23]

25. A device as in claim 21, wherein said area of connection forms a closed perimeter.

[c24]

26. A device as in claim 25, wherein said closed perimeter defines a hermetically sealed chamber.

[c25]

27. A device as in claim 26, wherein said hermetically sealed chamber holds a vacuum relative to the surround environment.

[c26]

28. A method, comprising:

bringing a first semiconductor substrate with a first metal film into contact with to a second semiconductor substrate with a second metal film, where both said first and second metal films are less than an order of magnitude thicker than the skin depth of the metal; and

applying microwaves to said first and second semiconductor substrates to bond said first metal film to said second metal film.

[c27]

29. A method as in claim 28, wherein said applying microwaves comprise applying microwave in a cylindrical cavity which is excited by a microwave source at the resonant frequency of a TM_{010} mode.

[c28]